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SCHOLARLY PUBLISHING AND OPEN ACCESS: SEARCHING FOR UNDERSTANDING OF AN EMERGING IS PHENOMENON

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Abstract

Scholarly publishing is concerned with the distribution of scholarly information through journals and conferences and other information media. As such scholarly publishing can be understood as a specific part of the information industry. With the advent of advanced information technologies many possible technologically enabled futures have been posited for scholarly publishing. This paper describes the current systems, processes and actors. While technological advancements appear to be enabling access to scholarly publications, economic conditions appear to limit access. In addition, a number of alternatives, such as open access are currently in play and there is uncertainty regarding the future of the scholarly publishing system. The system appears to be in the process of being reassembled. Conceptual models of the traditional, the electronic, and some possibilities for future developments in scholarly publishing are proposed, as are topics for future research in the information systems domain.

Keywords

Scholarly publishing, information technology, open access, institutional repositories, disciplinary repositories,

1 INTRODUCTION

Scholarly peer-reviewed articles and conference papers are crucial in the work of academics, scholars and other researchers. Scholarly publishing is concerned with the distribution of those peer-reviewed articles through journals and conferences and other information media. As such scholarly publishing can be understood as a specific part of the information industry. To begin research in most fields, the previous relevant scholarly and scientific literature of that and related fields, is generally consulted. This previous research is most commonly published in journals and conference proceedings, where the research papers are "refereed" by qualified experts prior to publication for quality control (Harnad, 2003) and to ensure that the research reported is rigorous and relevant in the terms of the disciplinary field being published. This research and publication process has been described as a "worldwide, collaborative, cumulative and self-corrective cycle of publishing, accessing, and using research findings in order to generate further findings, applications and publications" (Bosc and Harnad, 2005). It could also be considered a worldwide, distributed, information system.

Historically scholars were able to purchase all the journals in their field (Hurd, 2004). As the number of journals and their costs increase scholars have become increasingly dependent on libraries to provide them with access to journals. (Dewatripoint, et al. 2006; Hurd 2004) and it is increasingly difficult for any institution or organisation to provide access to all, or even most of them. The bigger publishers have responded with the "Big Deal" which is designed to increase access and decrease costs. However, the jury is still out regarding the usefulness or otherwise of the "big deals". "Big deal" licences can restrict access to independent scholars and distance students or distributed campuses and limit inter-library loans. They often force libraries to purchase a big publishers bundle rather than the actual journals the organisation requires and can place constraints on cancellations which mean libraries are tied to subscriptions over time with big publishers, and journal subscriptions from smaller publishers such as learned societies may suffer. Collections lose differentiation, and an organisations' collection is diluted with titles it may not need (Ursin, 2007; Dewatripoint, et al. 2006; Hurd, 2004). In addition technology has advanced so that the information within scholarly peer reviewed journals is available over the Internet at the individual researcher's desk top. Thus, economic conditions appear to be limiting access to the scholarly corpus while technological advancements appear to be encouraging access.

One response to these changes has been that individual researchers are making their work "open access". For the purposes of this paper, a widely accepted definition of "Open access" (OA) (Drott, 2006; Budapest Open Access Initiative, n.d.) is adopted and refers to work that is freely available via the Internet without financial cost or legal or technical barriers. Users can "read, download, copy, distribute, print, search or link" (Budapest Open Access Initiative, n.d.) to the full text of open access works, although it is expected that they respect the integrity of authors work and authors rights to be correctly acknowledged and cited. Authors can make their work open access in several ways, the most common of which are either; to post their work to their own web sites or to an institutional or disciplinary repository created to store, preserve and disseminate their research (known as self-archiving); or to publish in an open access journal. It is important to note that there are disciplinary differences in the way self-archiving occurs, with some disciplines self-archiving post-prints, that is their work that has been refereed and accepted for publication by established journals, and others self-archiving preprints – that is un-refereed work (Harnad 2003). This paper recognises these differences, but for space and time considerations elects to present a simplified overview.

Works that are self-archived are generally works that scholars give away without expectation of payment, for example works published in traditional peer-reviewed journals or conference proceedings. Self- archiving of this work can occur at the pre-print (an unrevised, un-refereed draft, unaccepted by a journal or conference) or post-print (all post publication works including the official published draft) stage. Some argue that self-archived open access work should include broader categories such as un-peer-reviewed pre-prints, learning objects and other scholarly work, and this is

hotly debated. It is, however, generally accepted that works for which an author expects payment, for example books, software, patented work, film and other creative works fall outside the open access realm (Suber, 2003; Budapest Open Access Initiative, n.d.). Harnad, Brody et al., (2004) have dubbed self archiving the "green" road to open access, as opposed to what they termed the "gold" road, which would involve converting journals to open access. Thus we see that scholarly publishing is created and maintained by an heterogenous network of aligned but separate interests.

The primary approach taken by this paper is that of conceptual analysis of the existing literature on scholarly publishing. Conceptual models of existing and potential actors and processes in scholarly publishing are developed from the literature, from one author's extensive experience as an academic librarian and a library manager, and from the other author's experience as a senior academic researcher, reader and writer in the information systems field and as an editor of an open access scholarly journal.

2 SCHOLARLY PUBLISHING – A CONCEPTUAL VIEW OF CURRENT PRACTICE

There are many definitions of scholarship (Halliday, 2001) and research. The UK Research Assessment Exercise (RAE) defines scholarship as "the creation, development, and maintenance of intellectual infrastructure of subjects and disciplines, in forms such as dictionaries, scholarly editions, catalogues and contributions to major research databases". The Australian Department of Education Science and Technology (DEST) defines research as "a systematic and organized way of finding answers to questions" (Australia Department of Education Science and Training (DEST), 2005). As Borgman (1990; 2000) explains; scholarship, or scholarly research is a social process, research is incomplete until it is shared with others. To be shared the scholarly research must be communicated, used, disseminated and developed within a community, a process Kling and McKim (1999) refer to as "scholarly communication". Scholarly communication can occur through formal and informal channels. Graham (2000) characterized scholarly communication in three channels: informal networks (often called the "invisible college"); initial public dissemination, for example via conferences or preprints; and formal publishing through journals and other similar outlets. Time and space restrictions mean this paper will look at the formal, and rather narrow, segment of scholarly output, specifically scholarly articles intended for publication in journals and other similar outputs such as edited books and conference proceedings. The phrase "scholarly publishing" in this paper refers only to this latter narrow subset of the scholarly communication system.

The scholarly publishing process is a large international information system, to which individual researchers, their institutions and organisations, libraries, commercial and learned organisation publishers and other organisations contribute in many ways. In addition, technology also plays a pivotal role in the process.

Actual scholarly publishing practices vary across disciplines (Kling and McKim, 1999) but essentially scholarly publishing is a formal means of communicating within a scholarly community (Halliday, 2001). But scholarly publishing also serves other purposes. Kling and McKim (1999) propose that scholarly publishing fills at least three purposes within a scholarly community; publicity, access and trustworthiness. Publicity is where the work is announced to audiences via a continuum of activities, from subscriptions, to abstracting and indexing through to advertising and citation. Accessibility refers to ways in which potential readers can access the work, independent of the author, over time, and in a stable way. Trustworthiness is another key concept and refers to the level of trust a reader can place in a work. It usually means that a work has been vetted through a social process, typically peer- review, author, publisher or journal reputation or sponsorship. Others (Prosser, 2005) posit other functions, for example registration (acknowledgement of who carried out the research, termed 'scientific paternity" by Guédon (2001)) and certification (peer review) which may be mapped to the concept of

"trustworthiness"; awareness which may be mapped to "publicity"; and archiving, which ensures the article will be obtained for posterity and constitutes the future part of "accessibility".

To this we should add another, less frequently acknowledged function. Journal publications have become an entrenched part of the academic reward system (Peek, 1996; Prosser, 2005). The academic reward structure either operates on simple counts of the number of papers published by various authors, academics or scholars, or counts of citations of individual papers, or assessment of the impact factors of particular journals in which an author publishes, each which serves to entrench the role of the journal, the latter most specifically as it is the "impact" of the journal that counts, not the impact of the individual paper (Prosser, 2005; Rodriguez, Bollen et al., 2006). Research assessment exercises such as the Research Assessment Exercise (RAE) in the UK and the proposed Research Quality Framework (RQF) in Australia underpin the notion that publication has as much to do with career progression as with the dissemination of research. Further, the culture of top tier journals, and the power of monopolistic journal publishers act as disincentives for authors and other actors to investigate alternative models of scholarly communication (Graham, 2000).

In addition to these first order functions of scholarly publishing, Prosser (2005) also finds second order functions for scholarly publishing, for example access to wider readership (for example the interested lay person or practitioner) or access for funding bodies and institutions to assess research and make decisions about future research; and third order functions. Here he speaks as a scholar, not a publisher, for in this category he places profit and surplus, which had he shareholders to satisfy, he may have classified as a first order function.

Different actors have different roles within the scholarly publishing environment. For example, academics and scholars write the articles in the first place and paradoxically they are also the main targets as readers of those same articles. They also provide the certification through peer review. The journals provide the registration of a work at publication. Multiple organisations provide awareness and accessibility, from the journal publishers themselves through their reputations, marketing departments and subscriber lists to commercial indexing and abstracting organisations and libraries. Archiving is provided by publishers to some extent (depending on their storage facilities and continuing existence) but also by libraries. Libraries also provide access to wider readerships, through walk in access to the public and inter-library loan and document delivery. Profits are invariably made only by the publishers directly, although one may argue that academics and scholars profit indirectly, through increased reputation, grants, tenure, promotion and so on (Kling and McKim, 1999; Graham, 2000; Kling and Callahan, 2003; Björk, 2005; Prosser, 2005)

Trustworthiness is aligned with the concept of "quality". Like trustworthiness, indicators of quality come from the knowledge that a scholarly article has been reviewed by knowledgeable peers who carefully read and judge work (i.e. peer review it), and published in "quality" journal titles (Drott, 2006). How journals are adjudged quality is a moot point, but one commonly accepted measure is the impact factor, a measure of importance of scientific journals. Impact factors are calculated each year by the Institute for Scientific Information (ISI) for those journals which it tracks, and are published in the *Journal Citation Reports (JCR)*. Impact Factors have a huge, but controversial, influence on the way published scientific research is perceived and evaluated. The impact factor is generally calculated based on a three-year period. For example, the 2003 impact factor for a journal would be calculated as follows: A = Number of times articles published in 2001-2 were cited in ISI tracked journals during 2003; B = Number of articles published in 2001-2; 2003 Impact Factor = A/B (Garfield, 1994 (amended 2004); Garfield, 2005). There are a number of criticisms of ISI impact factors being used to judge journal quality, an important one being that research outputs in humanities, arts and social sciences are often published in books (and indeed other formats) rather than journals, and ISI rarely produces citation counts and therefore Impact Factors for books. Similarly arts, humanities and social science journals that do exist, even those highly regarded by scholars, are often not included in ISI databases which are heavily biased towards the sciences (East, 2006).

A number of writers have tried in very different ways to define and visually represent the scholarly publishing process. Examples include UNISIST(1971 reported in Søndergaard et al. 2003); a revised UNISIST (Søndergaard et al, 2003); Garvey and Griffith (1972 reported in Hurd, 2004); Hurd, (2004) Björk (2005) and Warner (2005).Most of these models are linear and sequential, for example Björk focuses on the concept of a scientific communication life cycle, which he presents as a formal, very detailed and complex model with a hierarchical structure including the whole scientific communication value chain. Warner (2005) represents the scholarly communication value chain as rather super-ordinate functions. We propose a more fluid, cyclical model where new influences can be seen to come in and go out, and which represents changes in the directions of the information flows.

On this basis we have integrated the core of the different approaches. Our conceptual model presents a simplified but representative picture (Figure 1) and illustrates that scholarly publishing is a cycle that roughly starts with research and writing, moves through certification and peer review to registration on publication. Once the work has been published it is made available to readers via publishers' subscriptions, libraries, and third parties such as listings in indexing and abstracting services. Once available it is, in the best possible world, used by fellow researchers to feed back into the research and writing cycle. Copies are also archived in libraries and sometimes by publishers for future reference, so it may at a later time, be called back into the cycle. Other activities grow from the central cycle: access is available for a wider readership, such as practitioners, patients, future research funders; published work is a part of the academic reward structure (which can influence whose and what work may be funded in the future); and publishers make a profit.

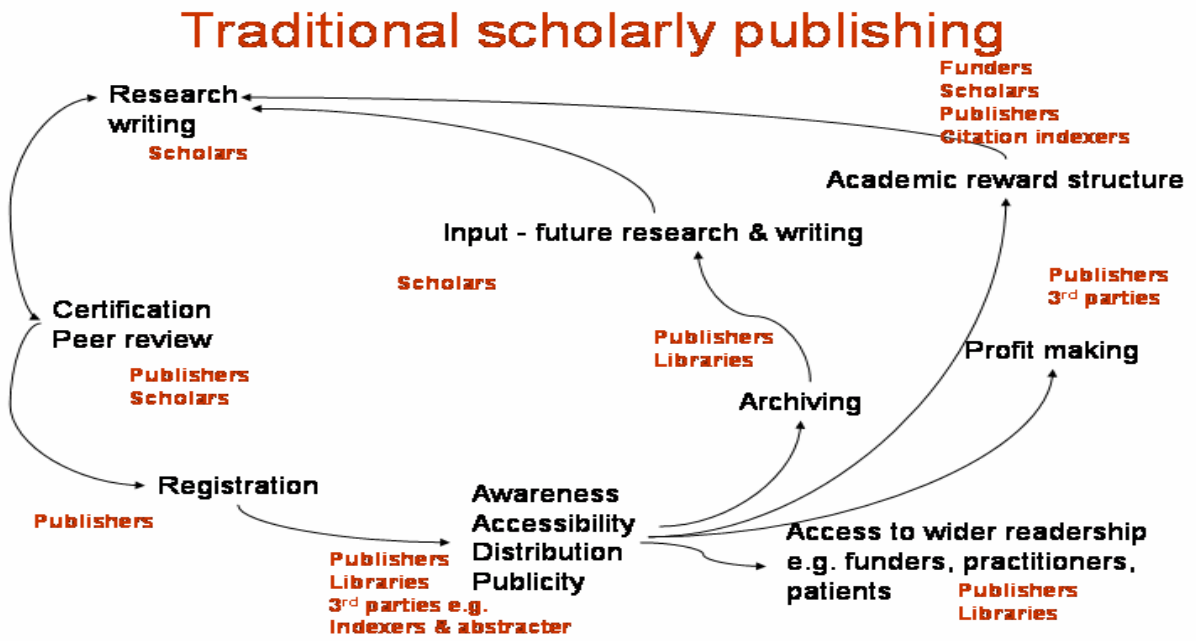

Figure 1. A conceptual model of traditional scholarly publishing.

3 SCHOLARLY PUBLISHING – A CONCEPTUAL VIEW OF ELECTRONIC PUBLISHING

Changing technologies from the 1970s have seen the dominant form of information provision change from printed journals to online or electronic provision. Online or electronic publication refers

primarily to the distribution medium (Kling and McKim, 1999). Søndergaard et al., (2003) propose an updated version of the UNISIST model which does consider the Internet's effects, for example enclosing the model within a punctuated ellipse as representative of the open boundaries of the domain. The other models mentioned in Section 2 also consider technology and the internet, but remain largely linear and hierarchical. Our conceptual model for electronic scholarly publishing (Figure 2) remains cyclical and when compared to the model of traditional publishing thus mainly contains changes in the awareness/accessibility/distribution/publicity activities of the process. The online provision of scholarly publications comes in many formats, for example in individual electronic journals, publisher collections of journals, aggregator collections of articles (often subject based and provided by commercial organisations as an adjunct to their existing indexing and abstracting services), or open access discipline or institution based repositories (Tenopir and King, 2000). While the dominant form of accessibility and distribution has changed from paper to electronic, the overall functions and roles within the system do not seem to have markedly changed. Individual subscriptions or shared subscriptions in libraries are still generally required for access, with the reader additionally requiring new actors such as Internet access and a computer. While the major access channel has changed in recent times from paper journals to online access, not much else has changed as demonstrated in Figure 2.

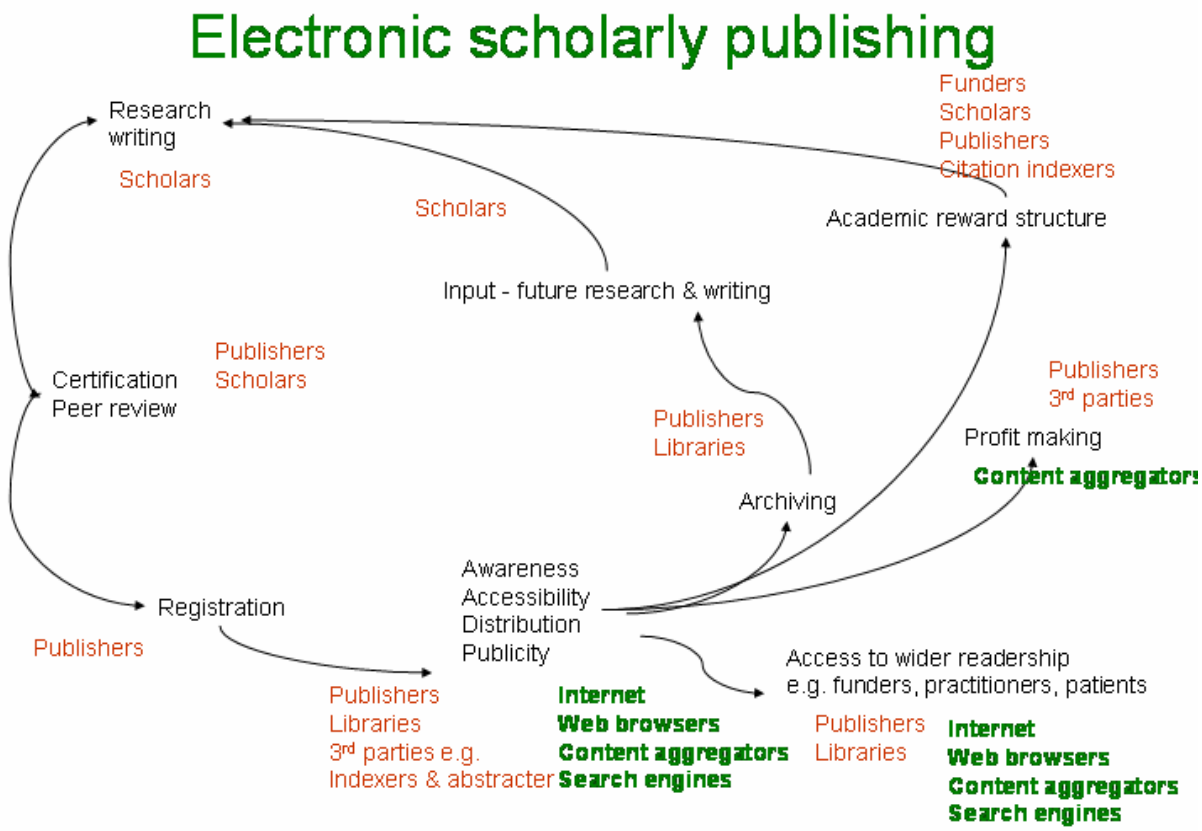

Figure 2. A conceptual model of electronic scholarly publishing

Figure 2 illustrates that while the increasing availability of journals and other publications over the Internet has been heralded as a new paradigm of electronic publishing; it is more a slow evolution of the traditional paradigm (Odlyzko, 2002). Similar structures are in place (Certification/Peer-review and Registration), similar actors are involved (publishers, scholars, libraries) and similar costs and profits are made and expended. Any financial profit to be made from the journals is still made by the publishing and indexing, abstracting and citation companies and their shareholders in return for the

services they offer such as managing peer review, marketing, dissemination, awareness, citation indexing etc. or by content aggregators which on-sell articles often themed by subject or discipline or available in different bundles by cost, although Tenopir and King (2000) point out that this may be as electronic journals are often adjuncts to the existing infrastructure of print journals provided by their publishers. While both paper and electronic paradigms are still in existence, publishers' revenue is from subscriptions to the paper titles and increasingly from subscriptions and site licences (to individuals, institutions and on-sellers or aggregators) to electronic titles, or collections of titles locked behind firewalls. In addition to escalating costs, publishers and aggregators concerned about their revenue stream use copyright legislation and licensing agreements (contracts) to limit what libraries may do with the licensed electronic journals they pay for, limiting the access to electronic journals way beyond the limitations that were placed in the print paradigm (English 2003). For example some licences restrict access to electronic journals for Inter Library Loan/ Document Delivery and/or to walk-in users in libraries. It has been argued that these cost and permission barriers work against the interests of researchers and the organisations to which they belong, which share the rewards of research impact (Houghton et al., 2003; Suber, 2003). Costs to readers or their access agents (e.g. libraries) are spiralling increasingly higher and universities and other research organisations can afford to purchase increasingly smaller percentages of available scholarly journals (Drott, 2006; Houghton, et al., 2003; Suber, 2003) and so what was previously a distribution network, is now in fact acting as a barrier to readers (Pinfield, 2005).

4 SCHOLARLY PUBLISHING – A CONCEPTUAL VIEW OF TECHNOLOGICALLY ENABLED POSSIBILITIES

Options have been flagged for new models of scholarly communication which better reflect the opportunities provided by new technologies (Harnad, 1995; Graham, 2000; Halliday 2001; Warner, 2005). A major one is open access. To recapitulate, a widely accepted definition of "Open access" (OA) (Drott, 2006; Budapest Open Access Initiative, n.d.) is adopted and refers to work that is freely available to users via the Internet without financial cost or legal or technical barriers. Users can "read, download, copy, distribute, print, search or link to" (Budapest Open Access Initiative, n.d.) the full text of open access works, although it is expected that they respect the integrity of authors work and authors rights to be correctly acknowledged and cited. Open access literature is free of charge to the user and the copyright holder consents to unrestricted use (Suber, 2003), but someone has to pay the costs for the infrastructure and maintenance.

Open access journals (known as the "gold road" to open access) are journals where all the content of the journal is freely available to readers. Costs are recouped in many different ways, for example, via author fees, institutional or organisational subsidies. Indeed, many commercial publishers offer hybrid open and subscription based access, funded in different ways, for example author or funder sponsorship or open access after a period of time (Suber, 2006). Thus there are many business models for open access journals.

Repositories, either institutional or disciplinary (known as the "green road") which utilise free open source or even proprietary software (Harnad, Brody et al., 2004; Swan et al., 2005) have been regarded as the alternative for which there are also many "business" models. Indeed Willinsky (2006) has posited "ten flavours of open access"., including hybrid subscription and author subsidized open access (Suber, 2006) such as that currently offered by some of the big publishers, such as Elsevier. Unlike open access journals which replace the current model of subscription based journals with other economic models, (although they still have the journal publisher managing certification and registration) self archiving in repositories is often regarded as an adjunct to the traditional process. Repositories provide open access, and are often funded by institutions, but traditional publishers still provide the certification and registration.

As open access grows more prolific it attracts the interest of research funders, such as universities and other research institutions, private funders such as the Wellcome Trust (2003; 2004), governments (the biggest providers of research funds). A U.K. Government Inquiry questioned how the output from publicly funded research could be handed free of charge to commercial organisations that increasingly make it difficult to access the publications resulting from the research (Gibson, 2005; Poynder, 2004). Benefits of open access for authors are clear – it lowers access barriers and disseminates research quickly. For readers access is also quick and easy from their desktop via common search tools or even from some repositories email alerts (Pinfield, 2005). The open access movement through the Open Archives Initiative (OAI) has developed protocols (OAI Protocol for Metadata Harvesting – OIA-PMH) that enable data providers (repositories) to expose structured data to the Internet, so that it can be harvested by service providers (such as specialised repository search engines, and even more general ones such as Google) to expose the information in repositories to people searching for information (Pinfield, 2005). OAI allows service providers to provide more than just search services such as citation analysis. Citebase (http://www.citebase.org) provides an early example of this.

These new models work within the existing structure, but with different routes and complexities, from those expressed in our conceptual model of traditional scholarly publishing and some are proposed and illustrated in Figure 3. New actors (often technologies) emerge and these new actors may subsume the roles or diminish the strength of existing actors. There are other models that may completely replace or circumvent the current model, that have not yet been fully explored, such as simply placing work on the web and allowing individual citation and downloads and reputation act as an informal kind of peer review, and many others which may not yet have been dreamed of or put into practice. An interesting difference to note between the existing ways of publishing as modelled in Figures 1 & 2 and the possibilities which actually exist for scholarly publishing as presented in Figure 3, is that there is a lot more activity occurring, with regard to peer reviewing and responses by readers as well as awareness, access, distribution and publicity through repositories, blogs or wikis and the activity involves a larger number of actors

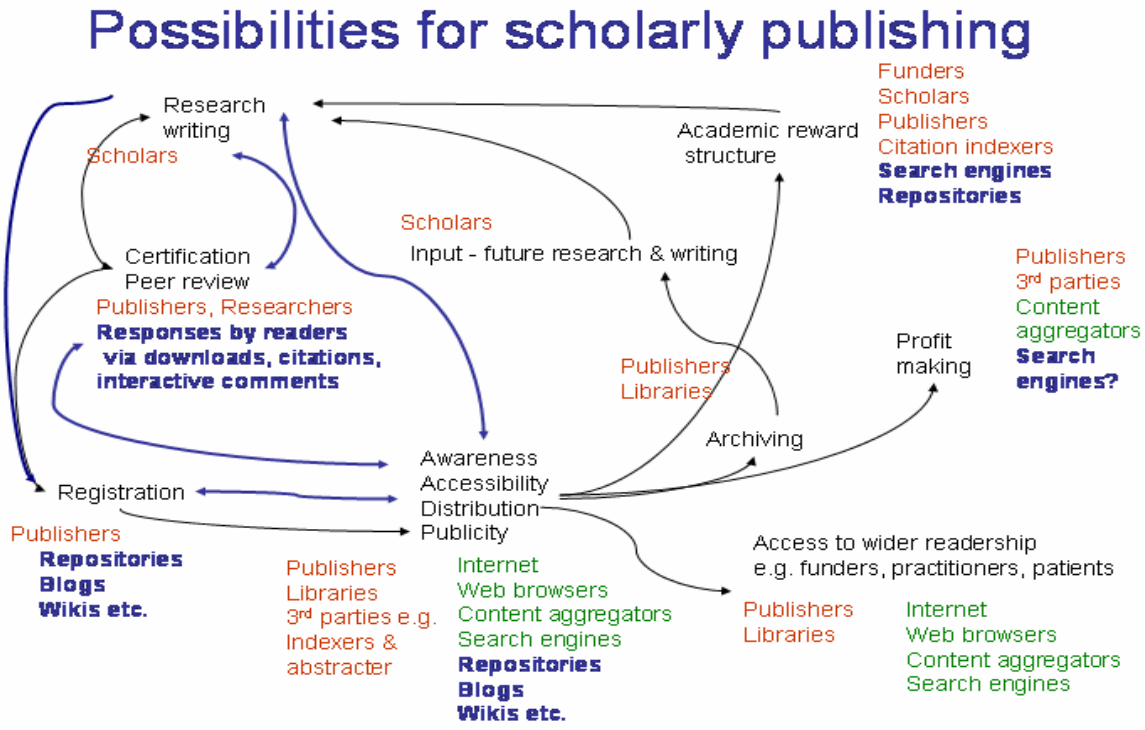

Figure 3. A conceptual model of the possibilities for publishing enabled by IT

Existing prototypes pointing to the potential of these technologically enabled futures include the *Scandinavian Journal of Information Systems*, (http://www.e-sjis.org/) an open access journal available to readers free of charge and *DLIST* the *Digital Library of Information Science and Technology* (http://dlist.sir.arizona.edu/) which provides an example of an open access repository which not only makes preprints and post-prints of articles, conference papers, presentations and other work available to the information science scholarly community and other interested readers, but is also experimenting with open reviews and comments, and the deposit of datasets, which may make changes to scholarly publishing beyond changes to access and distribution.

There is opposition to institutional and disciplinary repositories and other forms of open access from commercial journal publishers who see that open access might harm their business and therefore their profits. There is further opposition from some of the scientific societies for whom sale of publications can form a significant part of income and subsidise their other activities (Goodman, 2004; Poynder, 2004). It is recognised that at present commercial and scholarly society publishers play a key role in scholarly communication, being largely responsible for organising the refereeing and review process, registration, copy writing and absorbing the commercial risk associated with publication, among other things. So the outcomes of the open access movement are anything but clear. For the moment the scholarly publishing position includes traditional (electronic AND paper) for-fee (what Harnad calls toll access - TA) journals, open access journals and open access repositories.

5 CONCLUSION

Thus new technical opportunities have motivated changes in scholarly publishing. The changes are emerging without us fully understanding what they may actually mean for scholarly communication and publishing, and how they may affect the nature of research and scholarly work. Increase in understanding in this area would benefit practitioners, scholars, funders and other actors within the system.

While implementation of open access institutional and disciplinary repositories is occurring, open access journals are becoming more prevalent and there is much discussion regarding the role of such systems and the effects they may have, there is little actual research. Further, while there is a common sense explanation of the “good” of such systems, they are under-utilised and their effects largely speculated upon (Mark Ware Consulting Ltd, 2004). Therefore future research to study the actual implementation of open access systems will lead to better understanding of the phenomena. Research could describe implementations and explore and explain the implementation and responses of stakeholders to the implementation process. The research could aim to increase understanding about how, when, where, and why academics and research students participate in the scholarly publishing system, both as readers and authors.

Advances in information and communication technologies are motivating change in scholarly publishing; a reassembling of the scholarly publishing system is under way. The changes are emerging without us fully understanding what the changes may actually mean for scholarly communication, even who the all current actors are, and how these changes may affect the nature of scholarly work. Broadly, this paper has reported the current situation and some emergent associations. It then proposes further research to enable fuller understanding both of the current situation and future possibilities.

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